

The opinion in support of the decision being entered today was *not* written for publication and is not binding precedent of the Board.

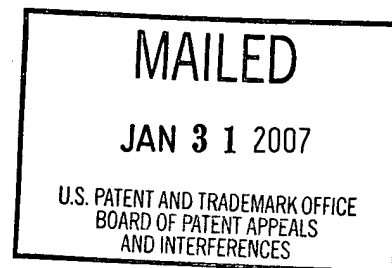
UNITED STATES PATENT AND TRADEMARK OFFICE

**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Ex parte JAMES C. MCKINNELL

Appeal No. 2006-2218
Application No. 10/029,649

ON BRIEF



Before BARRY, BLANKENSHIP, and SAADAT, *Administrative Patent Judges*.

SAADAT, *Administrative Patent Judge*.

DECISION ON APPEAL

This is a decision on appeal under 35 U.S.C. § 134(a) from the Examiner's final rejection of claims 1-4, 6-11, 14-17, 33 and 34. Claims 5, 12 and 13 have been canceled and claims 18-32 and 35-39 have been withdrawn from consideration as being drawn to a non-elected invention.

We affirm.

BACKGROUND

Appellant's invention is directed to a method of bonding semiconductor substrates or wafers with a bonding material that includes an oxide affinity material. According to Appellant, instead of the conventional ways of removing the unwanted native oxide, which is formed on the exposed surface of the wafer, a reducing agent included in the bonding material removes the native oxide from the interface (Specification, 3). An understanding of the invention can be derived from a reading of exemplary independent claim 1, which is reproduced below:

1. An electrical device comprising:

first and second substrates having respective first and second integrated circuits, wherein at least one of the first substrate or the second substrate has a semiconductor layer thereon; and

a bond structure bonding the first substrate to the second substrate, the bond structure including an alloy:

bonded to the semiconductor layer;

composed of noble metal alloyed with an oxide affinity material having an affinity for oxygen higher than that of the material of which the semiconductor layer is composed such that the alloy is sufficient to remove a native oxide from an interface surface between the bond structure and the first substrate; and

configured to form an electrical connection between the first integrated circuit and the second integrated circuit.

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The Examiner relies on the following prior art references:

Ohara	US 5,668,033	Sep. 16, 1997
Terasawa	US 5,702,962	Dec. 30, 1997
Merchant	US 6,118,181	Sep. 12, 2000

Claims 1, 3, 4, 6-10, 14-16, 33 and 34 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Merchant and Terasawa.

Claims 2, 11 and 17 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Merchant, Terasawa and Ohara.

We refer to the briefs and answer for the respective positions of Appellant and the Examiner. Only those arguments actually made by Appellant have been considered in this decision. Arguments which Appellant could have made but chose not to make in the briefs have not been considered (37 C.F.R. § 41.37(c)(1)(vii)).

OPINION

With respect to the rejection of claims 1, 3, 4, 6-10, 14-16, 33 and 34, the focus of Appellant's arguments is that the prior art teachings do not recognize the claimed alloy properties for oxide removal since bonding of the substrates in both

Merchant and Terasawa are performed subsequent to removal of native oxides from the substrates (Br. 12-15). In particular, Appellant asserts that it is by including the recited oxide affinity material in the amount recited that the cleaning of the oxide, as described by the references, becomes unnecessary (Br. 15).

In response, the Examiner asserts that the cleaning step described in Merchant is performed to clean the surface of chromium layer 29 and has nothing to do with the bond layer 27 which is suggested to include other elements in place of or in combination with palladium (Answer 13). The Examiner further argues that Terasawa, while suggesting the use of acids for removal of native oxide, does provide for an Au-Sb alloy as the metal layer 62 at the interface of the two joining substrates (Answer 14).

We disagree with Appellant (Br. 13) that because a cleaning step prior to joining the substrates is suggested, the disclosed alloy as modified by Terasawa does not remove the native oxide. The claims require that "the alloy is sufficient to remove a native oxide" which merely requires that the alloy have oxide removal capability instead of actually removing the oxide.

Merchant, on the other hand, describes cleaning of the wafer surface prior to bonding as unnecessary (Merchant, col. 5, ll. 30-35) implying that bonding still takes place even if the cleaning step is not performed. The bonding alloy that includes the oxide affinity material can then remove the oxide when the cleaning step is not performed and native oxide is present. As argued by the Examiner (Answer 14), the metal layer 62 of Terasawa is sufficient to remove a native oxide from the bonding interface between the substrates since the metal layer is made of Au-Sb alloy which has an affinity for oxygen higher than that of silicon (Terasawa, col. 5, ll. 12-21).

We also observe that a composition ratio or the amount of the oxide affinity material in the bond structure for the gold alloy, as argued by Appellant (Br. 19), is not described in Appellant's Specification. Therefore, to the extent disclosed, any combination ratio of Au-Sb specified by the references is capable of removing the native oxide on the silicon substrate interface.

Based on our analysis above, we remain unpersuaded by Appellant's arguments that the Examiner erred in determining the obviousness of the claimed subject matter. Accordingly, as the Examiner has established a prima facie case of obviousness with

CONCLUSION

In view of the foregoing, the decision of the Examiner rejecting claims 1-4, 6-11, 14-17, 33 and 34 under 35 U.S.C. § 103 is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED

~~LANCE LEONARD BARRY~~
~~Administrative Patent Judge~~

HOWARD B. BLANKENSHIP
Administrative Patent Judge

MAHSHID D. SAADAT
Administrative Patent Judge

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HEWLETT-PACKARD COMPANY
INTELLECTUAL PROPERTY ADMINISTRATION
P.O. BOX 272400
FORT COLLINS, CO 80527-2400